C8 Culvert Design

C8.1 General

C8.1.1 Policy overview

C8.1.2 Design information

C8.1.3 Definitions

C8.1.4 Abbreviations and notation

C8.1.5 References

C8.1.5.1 Direct

C8.1.5.2 Indirect

C8.2 Reinforced concrete box (cast-in-place)

C8.2.1 Loads

C8.2.1.1 Dead

C8.2.1.2 Live

C8.2.1.3 Dynamic load allowance

C8.2.1.4 Water

C8.2.1.5 Earth pressure

C8.2.1.6 Construction

C8.2.2 Load application

C8.2.2.1 Load modifier

C8.2.2.2 Limit states

C8.2.3 Analysis and design

C8.2.3.1 Barrels

The 4% limit for wall compression reinforcement is a carryover from the culvert design program used in the office prior to the transition to LRFD.

C8.2.3.2 Headwalls

C8.2.3.2.1 Wings

C8.2.3.2.2 Parapet

C8.2.3.2.3 Apron

C8.2.3.2.4 Curtain wall

C8.2.3.3 Barrel extensions

C8.2.3.4 Flumes and flume basins

C8.2.3.5 Other

C8.2.4 Detailing

C8.2.4.1 Standard plans

C8.2.4.2 Software

C8.2.4.3 Plan preparation

C8.2.4.4 General

C8.2.4.4.1 Excavation

C8.2.4.4.2 Granular blankets

C8.2.4.4.3 Keyways

C8.2.4.4.4 Reinforcement

Methods Memo No. 169: Revision to Section 4.2, Culverts without fill
1 April 2008 (Section 4.2 refers to the previous Bridge Design Manual. CADD Note E624/M624 was revised for new numbering in 2009 Iowa DOT Standard Specifications.)

C8.2.4.5 Barrels

C8.2.4.5.1 Roadway on slab

Methods Memo No. 169: Revision to Section 4.2, Culverts without fill
1 April 2008 (Section 4.2 refers to the previous Bridge Design Manual. CADD Note E624/M624 was revised for new numbering in 2009 Iowa DOT Standard Specifications.)

This memo is the basis for the text in the manual.

C8.2.4.5.2 Construction joints

C8.2.4.5.2.1 Transverse

C8.2.4.5.2.2 Longitudinal

C8.2.4.5.3 Bell joints

Methods Memo No. 152: Maximum Joint Openings for Bell Joints
17 August 2006

Partially revised: Methods Memo No. 28: Bent Bars in Flumes and Bell Joints
22 October 2001 (Class C lap lengths in this memo are from the AASHTO Standard Specifications. Due to different units in the AASHTO LRFD Specifications and associated constants, the lap length for #7 bars may be reduced by one inch. Also, a 6-inch spacing and a clear cover of 3 inches in the direction of spacing are acceptable under both specifications. The metric bar sizes in this memo are unavailable due to changes in the reinforcing bar industry.)

C8.2.4.5.4 Horizontally curved alignments

C8.2.4.5.4.1 Layout

C8.2.4.5.4.2 Transverse reinforcement

Methods Memo No. 31: Box Culverts (Detailing Bends)
30 August 2001 (Note that in-house programs SIGLBOX and MULTBOX no longer are available. The title for the last figure in the attachment has been corrected.)

C8.2.4.5.4.3 Longitudinal reinforcement for single barrels

C8.2.4.5.4.4 Longitudinal reinforcement for multiple barrels

C8.2.4.5.5 Wall penetrations

C8.2.4.5.5.1 Pipes

C8.2.4.5.5.2 Weep holes

C8.2.4.5.6 Settlement and camber

C8.2.4.6 Headwalls

C8.2.4.7 Inlets

C8.2.4.7.1 Trash racks

C8.2.4.7.2 Debris racks

C8.2.4.7.3 Safety grates

C8.2.4.7.4 End walls

C8.2.4.7.5 Slope tapered inlets

C8.2.4.7.6 Drop inlets

C8.2.4.8 Outlets

C8.2.4.8.1 Flumes

Partially revised: Methods Memo No. 28: Bent Bars in Flumes and Bell Joints
22 October 2001 (Class C lap lengths in this memo are from the AASHTO Standard Specifications. Due to different units in the AASHTO LRFD Specifications and associated constants, the lap length for #7 bars may be reduced by one inch. Also, a 6-inch spacing and a clear cover of 3 inches in the direction of spacing are acceptable under both specifications. The metric bar sizes in this memo are unavailable due to changes in the reinforcing bar industry.)

C8.2.4.8.2 Scour floors

C8.2.4.8.3 Basins

C8.2.4.9 Extensions

C8.2.4.9.1 Connections

~~C8.2.4.9.1~~C8.2.4.9.2 Skewed reinforcement

~~C8.2.4.9.2~~C8.2.4.9.3 Bell joints

~~C8.2.4.9.3~~C8.2.4.9.4 Backfill

C8.2.4.10 Bridge replacements

Methods Memo No. 191: Vent Hole Layout for Flowable Mortar Placement
1 March 2008

C8.2.4.11 Miscellaneous

C8.2.4.11.1 Fish baffles and weirs

C8.2.4.11.2 Drain pipe anchors

C8.2.4.11.3 Pipe hand railings

C8.3 Precast concrete box

~~**Methods Memo No. 224: Amendment to MM No. 125**~~
~~**July 2010**~~

~~**Methods Memo No. 125: New Issue Precast Culvert Standards and Plan Development**~~
~~**6 December 2005 (The intended-to-be-attached submittal sheets and updated sheets are available on the office web site, but with a new address: www.iowadot.gov/bridge/v8preculstd.htm. See MM No. 224 for amendment.)**~~

~~These two memos are the basis for the article in the manual.~~

C8.3.1 Loads

C8.3.2 Load application

C8.3.3 Analysis and design

C8.3.4 Detailing

C8.4 Concrete pipe

C8.4.1 Loads

C8.4.2 Load application

C8.4.3 Analysis and design

C8.4.4 Detailing

C8.4.4.1 Standard plans

C8.4.4.2 Software

C8.4.4.3 Plan preparation

C8.4.4.4 General

C8.4.4.5 Pipes

C8.4.4.6 Headwalls

C8.4.4.7 Inlets

C8.4.4.8 Outlets

C8.4.4.8.1 Flumes

C8.4.4.9 Extensions

C8.4.4.10 Miscellaneous

C8.4.4.10.1 Pipe hand railings

Appendix for obsolete and superseded memos

Obsolete: Methods Memo No. 96: Revised Culvert Wall Thickness
6 October 2004 (The office no longer designs metric culverts. Article 4.1.6 refers to the previous culvert manual section that has been superseded.)

Obsolete: Methods Memo No. 125: New Issue Precast Culvert Standards and Plan Development 6 December 2005 (The intended-to-be-attached submittal sheets and updated sheets are available on the office web site, but with a new address: www.iowadot.gov/bridge/v8preculstd.htm. See MM No. 224 for amendment.)

Obsolete: Methods Memo No. 224: Amendment to MM No. 125 July 2010